

CLAIMS

1. A gearshift control system for a hybrid-drive electric vehicle, comprising:
 - an engine (1);
 - a transmission (2) for changing and transmitting a rotation of an input shaft to wheels via an output shaft;
 - a clutch (3) for connecting and disconnecting power transmission between an output shaft of the engine (1) and the input shaft of the transmission (2);
 - a rotating electric machine (4) connected to a side of the input shaft of the transmission (2) for operating as an electric motor and an electric generator;
 - a storage element (9) for storing an electric power supplied from the rotating electric machine (4);
 - determining means for determining whether or not a gear shifting request of the transmission (2) exists;
 - clutch disconnection means for disconnecting the clutch (3) upon the gear shifting request of the transmission (2);
 - neutral position setting means for changing over a gear position of the transmission (2) to a neutral position when the clutch (3) has been disconnected;
 - mode selecting means for selectively operating the rotating electric generator (4) in a motor mode and in a power generating mode so that a rotational speed of the input shaft of the transmission (2) reaches a region of a synchronizing rotational speed depending on a requested gear position; and
 - gear setting means for setting the gear position of the transmission (2) from the neutral position to the requested gear position.

2. The gearshift control system according to claim 1, wherein:

the mode selecting means is configured to operate the rotating electric machine (4) in the motor mode or in the power generating mode in accordance with a charging state of the storage element (9).

3. The gearshift control system according to claim 1, wherein:

the mode selecting means is configured to calculate the region of the synchronizing rotational speed of the input shaft of the transmission (2) based upon a rotational speed of the output shaft of the transmission (2) and a gear ratio required for gear shifting, and maintain the motor mode or power generating mode currently applied until the rotating speed of the input shaft of the transmission (2) reaches the region of the synchronizing rotational speed.

4. The gear shift control system according to claim 1, wherein:

the mode selecting means is configured to operate the rotating electric machine (4) in the power generating mode in order to decrease the rotational speed of the input shaft.

5. The gearshift control system according to claim 1, wherein:

the mode selecting means is configured to operate the rotating electric machine (4) in the motor mode in order to increase the rotational speed of the input shaft.

6. The gearshift control system according to claim 5, wherein:

the mode selecting means is configured to operate the rotating electric machine (4) in the power generating mode until the rotational speed of the input shaft of the transmission (2) reaches the region of the synchronizing rotational speed in the vicinity of a zero value after the clutch means disconnects the clutch (3), when the vehicle is stationary and the gear shifting request of the transmission (2) from the neutral position has been determined to exist.

7. The gearshift control system according to claim 1, wherein:

the clutch disconnection means is configured, when the gear shifting request of the transmission (2) has been determined to exist, to disconnect the clutch (3) and maintain the clutch (3) disconnected until gear setting to the requested gear position completes, if the vehicle is traveling by an output of the engine (1), and to disconnect the clutch (3) and maintain the clutch (3) disconnected even after gear setting to the requested gear position completes, if the vehicle is traveling by an output of the rotating electric machine (4).

8. The gearshift control system according to claim 1, wherein:

the storage element (9) comprises an electric double layer capacitor.